THURSDAY, APRIL 5, 1917.

THE TEACHING OF PHYSIOLOGY.

(1) *Human Physiology: a Text-book for High Schools and Colleges.* By P. G. Stiles. Pp. 405. (Philadelphia and London: W. B. Saunders Co., 1916.) Price 6*s.* 6*d.* net.

(2) *The Problems of Physiological and Pathological Chemistry of Metabolism for Students, Physicians, Biologists, and Chemists.* By Dr. Otto von Fürth. Authorised translation by Prof. Allen J. Smith. Pp. xv+667. (Philadelphia and London: J. B. Lippincott Co., n.d.) Price 25*s.* net.

(1) AT the January Conference of Headmasters a resolution was passed recommending the teaching of the "natural laws underlying the phenomena of daily life." A similar resolution was passed at a meeting of the Association of Science Teachers, in which the value of exciting a "spirit of interest and inquiry with regard to the world around us and the universe at large" was emphasised (see NATURE of February 1, p. 442). It was thought that the best way of doing this was by courses of generalised science. It was doubtless not intended to exclude knowledge of the activities of living organisms, inclusive of man, and of our own bodily functions. In other words, physiology should be part of the course. We may remember Huxley's advocacy of physiology as of especial value as a means of mental discipline, and it has also an important practical side. The ignorance of most people with regard to questions of vital consequence is scarcely less than scandalous, and it is unfortunate that there appears to be a widespread belief that physiology is only of use to the medical man. Of course, it is necessary to him in order that he may understand the abnormalities of disease; but a knowledge of the normal working of our bodies is surely a matter that concerns everyone. The pressing question of food is one that presents itself at once, and there are many others.

The book before us is an excellent attempt to provide a text-book for high schools. But, good as it is as an elementary account of the present state of physiological science, it cannot be regarded as altogether successful. It is apt to be dull and didactic rather than stimulating. This is probably incidental to the practice, intentionally adopted, of omitting reference to names of discoverers and details of experimental procedure. In the hands of a good teacher such details may be made to give a human interest to dry description, and bring what is being taught into relationship with other bodies of knowledge, such as history and art, a valuable aspect of true education. It would be an improvement if a part of the wealth of the book in facts were sacrificed for a more intensive treatment of some of them. In certain cases further space could be found by omitting reference to views that are now disproved. Similarly, a rather more dogmatic tone might be used in many instances. A text-book should take the responsibility of recommending a particular view as being most in accordance with facts, although this view may be contrary to the opinion of some isolated physiologists.

It will be agreed that the mode of teaching of science suggested in the resolutions given above depends for its success almost entirely upon the teacher. A very wide knowledge is required, not only of science, but of other branches of learning, and it may well be that a special training is advisable. Indeed, the capacity necessary is probably of a higher order than that of many a university professor. It need scarcely be said that the right kind of teacher must be able to demand a high salary.

We cannot help expressing the hope that preparation for any particular examination will be left entirely out of account. The conviction is forced upon us more and more that the examination system has a very serious degrading effect both upon the teacher and the student. It is natural that the student, whose prospects depend on passing some examination, has little inducement to take account of questions or new advances in science, however important they may be, if they are not to be found in the recognised text-books, while the teacher feels reluctant to refer to them, however hampered he may be by his inability to do so. Moreover, there is an ever-present temptation to learn a number of facts by heart, since most examinations are easily passed in this way. If time is taken to understand principles, although the student is hereby caused to think for himself, he may well find that some facts have to be neglected. Under the present system facts count for more than laws. It is to be feared that Prof. Stiles's book may lend itself to the mere committal to memory. The examination problem is undoubtedly one of great difficulty, and at present no satisfactory solution is in sight. It seems that, on the whole, a book frankly written for the teacher rather than for the student would be the more useful for schools. In such a case more attention could be given to the experimental side. This does not really require elaborate and costly apparatus. It is astonishing what a wealth of significance there is in such a simple experiment as the burning of sugar in air and comparing the products with those given off in the breath.

A word must be said on the manner of dealing with the question of sex—a difficult problem for the teacher, but one that ought not to be shirked. Prof. Stiles's treatment is good, so far as it goes. But we are inclined to think that a reference to the physiological meaning and value of the union of two individuals as the basis of the discussion would go far to remove the mischievous way of looking at such problems which is almost universal.

The book is remarkably free from errors. We have detected only one serious mistake. On

© 1917 Nature Publishing Group

p. 303 the fat resynthesised in the intestinal wall is stated to be different from the original fat hydrolysed in the cavity of the intestine. This is not the case.

(2) Dr. von Fürth's book is well known to many of us in the original as a valuable presentation of the facts of the subject at the time it was written. The use of the word "problems" in the title may cause a little disappointment to those who look for assistance in attacking difficult questions; something resembling Leathes's "Problems of Animal Metabolism" may have been expected.

It seems doubtful to the reviewer whether the translation of a general text-book is worth the trouble and expense unless the translator is possessed of the knowledge and capacity to bring it up to date. A new edition of the original work is almost certain to appear before the translation is exhausted, so that the latter prolongs the life of an antiquated edition, which is undesirable. The contents of the present book date from some time prior to 1913. On the whole, it is questionable whether any real necessity existed for its translation, since there are other books in the English language which serve the purpose. W. M. Bayliss.

SOME MATHEMATICAL TEXT-BOOKS.

(1) *Dynamics.* By R. C. Fawdry. Part i. Pp. viii + 177 + ix. (London: G. Bell and Sons, Ltd., 1916.) Price 3*s.* net.

(2) *Differential and Integral Calculus.* By Dr. Clyde E. Love. Pp. xviii + 343. (New York: The Macmillan Co.; London: Macmillan and Co., Ltd., 1916.) Price 9*s.* net.

(3) *Engineering Applications of Higher Mathematics.* By V. Karapetoff. Part ii. Pp. iv + 103. Part iii. Pp. v + 113. Part iv. Pp. v + 81. Part v. Pp. vii + 64. (New York: John Wiley and Sons, Inc.; London: Chapman and Hall, Ltd., 1916.) Price 3*s.* net each.

(1) THIS is a text-book of elementary dynamics, leading up to circular motion. One naturally turns first to see how the foundations are treated, and here we must confess to some disappointment. Various experiments with a "trolley-apparatus" are quoted, and are used as a basis for the fundamental inductions. As a matter of fact, dynamics did not begin in this way, but with the testing of hypotheses. Such experiments are useful and instructive enough, as verifications, at a somewhat later stage; but they are too rough and too liable to error to serve as the basis of dynamical faith. They are also necessarily indirect, and various assumptions have to be made before they can be regarded as bearing specifically on the points they are meant to illustrate. The article on "mass" also is vaguely worded, and scarcely adequate to its purpose. Nevertheless, the book has points which may make it useful to a teacher who takes the theory largely into his own hands. The examples are well chosen and of the right standard of difficulty, and there are good exemplifications of such things as relative motion and centrifugal force.

(2) This book gives an account of the calculus from the first elements to the theory of ordinary differential equations. It includes also chapters on the applications to geometry and mechanics. Since the whole takes up only some 300 pages, it will be seen that the treatment is necessarily concise. It can, however, be recommended as a good introduction to the subject, and it is doubtless intended that it should be supplemented by plentiful oral comment. The examples are of a simple character, and bear directly on the text.

The book, naturally and properly, having regard to its scale, does not attempt to deal with the more abstruse logical points which present themselves in the beginning of the subject. The author is, however, to be congratulated on the practice he has generally adopted of stating explicitly when he makes an assumption which it is not convenient to stop and prove. There are two respects in which he has, we think, been unduly conservative. The treatment of the exponential and logarithmic functions and of their derivatives scarcely brings out the special importance of the former function, the logarithm being practically used as the primary conception. The proof of Taylor's theorem, again, is of the usual indirect and artificial character. One cannot but feel sympathy for the type of student whom Todhunter tried (vainly, we hope) to placate with the somewhat cruel remark that "he must not, while engaged in the elements of a subject, expect to be able, as it were, to *rediscover the theorems for himself.*" It is no doubt difficult to present these matters in a way at once natural and fairly rigorous, but the attempt should be made.

(3) We have here four parts of a work on the application of higher mathematics to engineering. In the words of the author:—"The book may be called a summary of the most common engineering applications of higher mathematics, or a mathematical cross-index to engineering textbooks. It fulfils its purpose if it saves the teacher the trouble of consulting many engineering books for the purpose of selecting a few mathematical problems for his students. The author also hopes that the book may stimulate interest in higher mathematics among his fellow-engineers." It should be said that the term "higher" is used in rather a restricted sense, and that the reader will find many quite elementary things explained to him. For example, it is formally proved that the minimum value of $x+y$ subject to the condition $xy=\text{const.}$ occurs when $x=y$; this with the help of the calculus!

The four slender volumes before us deal with hydraulics, thermodynamics, elasticity, and electricity respectively. The treatment is, on the whole, sound, though the diction is often rather loose. For instance, it is not easy to justify the offhand statement that the internal stresses in a cross-section of a beam are proportional to the bending moment, "since the action of these forces is to bend the beam." The mathematical work is not distinguished by neatness, and one finds awkward and cumbrous proofs where often quite

© 1917 Nature Publishing Group